Journal of Infection and Public Health (2017) 10, 129—132

http://www.elsevier.com/locate/jiph

SHORT COMMUNICATION

Lung abscess from *Staphylococcus aureus* after varicella infection in a 3-month-old infant

Deniz Aygun[a,*], **Fatih Aygun**[b], **Ayse A. Kılınc**[c], **Halit Cam**[b], **Haluk Cokugras**[a], **Yıldız Camcıoglu**[a]

[a] *Department of Pediatric Infectious Diseases, Clinical Immunology and Allergy, Cerrahpasa Medical Faculty, Istanbul University, Istanbul, Turkey*
[b] *Department of Pediatric Intensive Care Unit, Cerrahpasa Medical Faculty, Istanbul University, Istanbul, Turkey*
[c] *Department of Pediatric Pulmonology, Cerrahpasa Medical Faculty, Istanbul University, Istanbul, Turkey*

Received 9 February 2016; received in revised form 8 April 2016; accepted 11 May 2016

KEYWORDS
Varicella;
Lung abscess;
Infant

Abstract Varicella is a common, highly contagious viral infection of childhood. Varicella is a usually benign and self-limited disease, but it can be complicated by severe bacterial infections, especially in immunocompromised hosts. In this study, we describe a previously healthy 3-months-old infant who was admitted with high fever, cough, and respiratory distress, who had a history of varicella infection three weeks before, with exposure from her adolescent, unvaccinated sister. A lung abscess caused by *Staphylococcus aureus* complicating the varicella infection was discovered. The patient was aggressively treated with drainage of the abscess and intravenous antibiotics and had a good recovery.

Introduction

Varicella is a vaccine preventable childhood disease caused by the varicella zoster virus (VZV), an alpha-herpesvirus of the genus *Varicellovirus*. Primary varicella infection is characterized by fever and a specific, generalized pruritic vesicular rash.

* Corresponding author at: Department of Pediatric Infectious Diseases, Clinical Immunology and Allergy, Cerrahpasa Medical Faculty, Istanbul University, Istanbul, Turkey.
Tel.: +90 532 7868682; fax: +90 212 6328633.
E-mail address: fdenizaygun@gmail.com (D. Aygun).

http://dx.doi.org/10.1016/j.jiph.2016.05.013

The virus is present in both the respiratory secretions and skin vesicles. It is transmitted through the airborne route with respiratory secretions and through direct contact with the skin lesions. It is an extremely contagious disease; in secondary household contacts the transmission rate can be as high as 90% [1,2]. Although, varicella is generally a mild and self-limited illness, it can cause severe complications in infants and immunocompromised patients [3]. Herein, we describe a case of a lung abscess due to *Staphylococcus aureus* complicating a varicella infection in a 3-months-old infant. Vaccination is the most effective strategy in preventing the complications of varicella. This case report highlights a rare complication of varicella and underscores the importance of vaccination against varicella for all age groups, as our case developed varicella after her adolescent unvaccinated sister's primary varicella infection.

Case report

A previously healthy 3-months-old female infant was admitted with high fever, cough, and respiratory distress. Three weeks prior to admission to the hospital, she had suffered from a varicella infection after exposure to her unvaccinated, adolescent sister's infection. She did not receive any treatment.

On examination, she had resolving lesions typical of varicella without superinfection of the skin. She was tachypneic, with a respiratory rate of 80 breaths/min and blood oxygen saturation was 84%. The body temperature was 39.8° C and the heart rate was 144 beats/min with poor perfusion. Auscultation of the lungs revealed decreased respiratory sounds in the right upper lobe. The remainder of the physical exam was unremarkable. Initial laboratory investigations revealed, total leukocyte count of 26300/ mm^3 (neutrophils: 19,600, lymphocytes: 4,700), hemoglobin 8 gr/dL, and platelet count of 437, 000/ mm^3. Erythrocyte sedimentation rate was 58 mm/h and C-reactive protein (CRP) was 11.4 mg/dL. Liver and renal function tests and electrolyte levels were all within normal ranges. Serum immunoglobulin levels were normal (immunoglobulin (Ig) G: 682 mg/dL (normal range: 232—1411), Ig M: 139 mg/dL (normal range: 0—145), Ig A: 7 mg/dL (normal range: 0—83). Cytometric analysis of T, B, and NK cells revealed normal values. Nitroblue tetrazolium test (NBT) was normal. Venous blood gas measurements were, pH: 7.32, pCO_2: 55.4 mmHg, pO_2:29.2 mmHg, $NaHCO_3$: 28.1 mmol/L, and BE: 2 mmol/L. For acute respiratory failure noninvasive positive pressure ventilation (NPPV) was initiated in pressure support mode (FIO_2 0.5, inspiratory positive airway pressure 12 cm H_2O, expiratory positive airway pressure 8 cm H_2O).

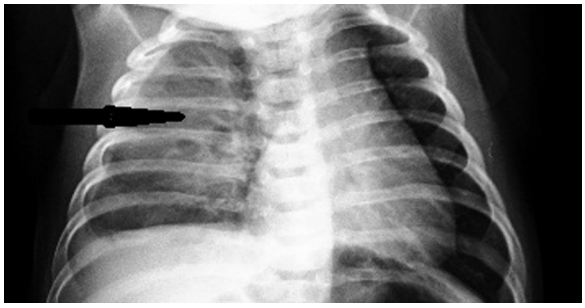

Fig. 1 Chest x-ray showing consolidation in the right lung with air bronchograms and hyper-infiltration of the left lung.

Chest x-ray showed consolidation in the right lung with air bronchograms, obliteration of the right costophrenic sinus, and hyper infiltration of the left lung (Fig. 1). Computed tomography (CT) scan of the chest demonstrated an abscess 1.5 cm in diameter in the left pulmonary field with an air-fluid level (Fig. 2). The abscess was percutaneously drained by pig-tail catheter insertion. Aspirated fluid appeared sludgy with studies as follows: white blood cell count 20/ mm^3 (predominantly polymorphonuclear leucocytes) glucose 30 mg/dL, protein 48.1 mg/dL, and LDH 22 IU/L. The culture of the abscess yielded methicillin resistant *Staphylococcus aureus*. On the fifth day of treatment, the catheter was removed. Based on the history of varicella, radiological and culture results, pneumonia and lung abscess were considered and parenteral

Fig. 2 Chest CT demonstrating a lung abscess in the left pulmonary field.

antibiotic therapy with vancomycin, cefotaxime, and acyclovir was initiated. Blood culture was sterile while the value of the sweat chloride test was normal and the tuberculin skin test was also negative. She received non-invasive ventilation for eight days. For the rest of her stay in hospital, the patient did not need ventilator support, and she remained afebrile. She completed three weeks of intravenous vancomycin and cefotaxime and seven days of acyclovir treatment. She was discharged three weeks after admission. X-ray control performed at 30 days post-hospitalization showed normalization of the pulmonary image.

Discussion

Varicella is a self-limited, benign disease of childhood but it can rarely be complicated by bacterial super-infections. The most common complication of primary varicella in previously healthy children is secondary bacterial infection of the skin and *Staphylococcus aureus* is the main causative microorganism [3]. Pulmonary complications of varicella are relatively uncommon in childhood [4]. Pneumonia following varicella is usually viral, although bacterial cases are more common in children younger than one year of age. Pneumonia and empyema complicating varicella have been reported previously in childhood but lung abscess after varicella is very rare [5].

The pathogenesis of abscess formation is thought to be skin barrier disruption and virus-induced immunosuppression. Cellular immunity is important in the immunogenicity of the infection. VZV alters phagocytic bactericidal activity and debilitates the mucosa of the respiratory system. Bacterial infection during the course of varicella in previously healthy children suggests that VZV may play a direct role in the pathogenesis of bacterial complications [6].

Prolonged duration of fever and high number of skin lesions can increase the complications. High and persistent fever that is unusual for the resolving state of varicella can be the presenting sign of an abscess as in our case. Early recognition, antibiotic treatment, and drainage of the infection can improve outcomes. Prompt respiratory support in an intensive care unit is also necessary to prevent sudden death, which can accompany hemorrhagic abscesses.

Acyclovir decreases the duration of fever, reduces the length of time that new lesions develop and accelerates healing. Although, there is not any randomized controlled study regarding the exact benefits of acyclovir usage, the clinical improvement of complications of varicella with treatment have been reported in selected series [7,8]. Acyclovir is also recommended to prevent secondary household transmissions of varicella, which can be more severe. However, acyclovir is only effective for preventing transmission of varicella if given during the first 24 h of the disease. However, in our case this was not possible due to the late admission.

Passive immunization with varicella-zoster immune globulin has been reported to lower the attack rate and complications of varicella; unfortunately, it is not available in our country.

Additionally, isolation can prevent transmission of chickenpox to healthy individuals and decrease further complications, such as what occurred in our patient [9]. However, it is not always possible because contagiousness begins 24—48 h before the appearance of lesions.

Beside treatment, the most important way to prevent varicella and its severe complications is vaccination. The sisters of our case were not vaccinated for varicella. VZV is the only herpes virus against, which a vaccine has been developed. Two doses of varicella vaccine are highly effective in preventing severe varicella. The rate of breakthrough varicella and related hospitalizations due to complications has dropped dramatically in children with two doses of varicella vaccinations [10]. This case emphasizes the importance of varicella vaccination to prevent varicella and its severe complications and reminds us that catch up vaccinations for adults and adolescents will prevent transmission of the virus to infants. In conclusion, we end with the comment that vaccination should be the primary strategy for public health practices and that all children should have the right to free vaccinations.

Compliance with ethical standards

Funding

None.

Conflict of interest

None.

References

[1] Ulrich H, Jane FS. Varicella Lancet 2006;368:1365—76.
[2] Feigin RD, Cherry J, Demmler-HarrisonGJ, Kaplan SL. Feigin and Cherry's textbook of pediatric infectious diseases. 6th edn. Philadelphia: Saunders; 2009.

[3] Ziebold C, von Kries R, Lang R, et al. Severe complications of varicela in previously healthy children in Germany: a 1-year survey. Pediatrics 2004;113:1470.
[4] Boutin A, Bosdure E, Schott A, et al. Pneumonia with empyema during varicella. Arch Pediatr 2008;15:1643—7.
[5] Yamaguchi H1, Nagumo K, Sasaki D, et al. Streptococcus pulmonary empyema after varicella infection in a serologically immunocompetent boy. Pediatr Int 2014;56:618—21.
[6] Rebahi H, Mouaffak Y, Soraa N, et al. Chickenpox complicated by pneumococcal meningitis: a rare coinfection. Arch Pediatr 2014;21:1226—8.
[7] Mohsen AH, McKendrick M. Varicella pneumonia in adults. Eur Respir J 2003;21:886—91.
[8] Schlossberg D, Littman M. Varicella pneumonia. Arch Intern Med 1988;148:1630.
[9] Asano Y, Yoshikawa T, Ihira M, et al. Spread of varicella-zoster virus DNA to family members and environments from siblings with varicella in a household. Pediatrics 1999;103:61.
[10] Bialek SR, Perella D, Zhang J, et al. Impact of a routine two-dose varicella vaccination program on varicella epidemiology. Pediatrics 2013;132:1134—40.